

Research Highlight

There is a critical need for carefully calibrated long-term data sets that can be used to evaluate long-term model runs, such as global climate model simulations, in order to ensure that models capture the observed range of variability (e.g., seasonal, diurnal, synoptic). The ARM Climate Research Facility has collected data at its facilities for over a decade, and these data sets are being analyzed to characterize the major modes of atmospheric variability in numerous geophysical variables. This study looked at a 14-year climatology of downwelling infrared radiance at 10 microns derived from atmospheric emitted radiance interferometer (AERI) observations at the ARM Southern Great Plains site.

The distribution of the downwelling 10 micron radiance is tri-modal. Using a neural network technique, the data were separated into clear-sky versus cloudy scenes, with the cloudy data further divided into optically thick and thin clouds. This classification scheme was used to characterize the observations within each of the three modes in the annual distribution. The warmest mode was predominantly associated with warm opaque clouds. The other two modes included contributions from both clear-sky and thin cloud classifications, but the relative contribution was strongly dependent on the precipitable water vapor and exhibited a seasonal dependence. Thus, there are large differences in the downwelling infrared radiance in the summer versus the winter, though the spring and autumn seasons have similar downwelling radiance distributions.

The overall distribution of downwelling infrared radiance is complex and demonstrates a strong dependence on cloud cover, season, and precipitable water vapor. Downwelling emitted radiance is an integrator of many atmospheric properties, including information about the profiles of temperature and water vapor, cloud properties (e.g., height, particle size, water path), and aerosol conditions above the observing site. Thus, the AERI observations provide a useful validation data set for GCM models over this midlatitude site.

Reference(s)

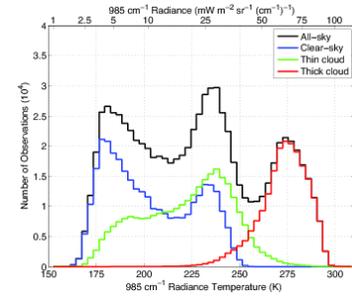
Turner DD and PJ Gero. 2011. "Downwelling infrared radiance temperature climatology for the Atmospheric Radiation Measurement Southern Great Plains site." *Journal of Geophysical Research – Atmospheres*, 116, D08212, doi:10.1029/2010JD015135.

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Working Group(s)

Cloud Life Cycle



The distribution of downwelling 10-micron infrared radiance observed at the SGP site by the AERI from June 1996 to May 2010, separated into all-sky (all samples) and the three distinct sky classifications.